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ABSTRACT

In this presentation the outlines of a general systems model for education which may be of value in the areas of curriculum development, course design and teaching are offered. It is based on what is called the "Principle of Natural Organization" which is defined as follows: every form tends to articulate its elements into functional structures; every whole is derived from the internal structuring of its parts. The model defines various cycles, stages and phases of organization and periods of divergence and convergence which are suggested as normative criteria for educational programming and practice. (SHM)

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NATURAL ORGANIZATION AND EDUCATION

Mark Braham

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NATURAL ORGANIZATION AND EDUCATION

Mark Braham [1]

1. Introduction

A continuing problem for the theory and practice of education concerns the need to develop comprehensive schema or models that can be utilized to tie together the proliferating fund of information and knowledge about the nature of man. The rationale for this is at least three-fold: (a) education, at base concerns humans as bio-psycho-social beings thus, (b) any attempt to provide for the organization of human learning, and to establish a theoretical foundation to justify programmes and practices must take this three-fold nature into account, and (c) the increase in information and knowledge about these discrete areas of human life has been so rapid and vast that we are lacking integrated concepts about the nature of man, and the role of education in human development.

As a consequence, educational programming and practice continues to be rather an ad hoc matter, with the individual worker resorting to whatever competencies he may have derived from a discrete field of enquiry and training, folk-wisdom and personal predilection in order to carry out his tasks. While this is problematic enough at the level of the individual teacher, whose actions involve a relatively small population of humans, it is compounded for the educational technologist who, through the development and use of hardware and software, film and television, sys-

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tems analysis and design is liable to have a much wider spread of effect because of the larger population that comes into his sphere of influence.

Without even turning to the technological dimension of education we have such writers as Brameld asking for "graphic 'models' of integration". . . for "systematized designs by which to draw together some of the specializations of knowledge and relate them to one another and to education" (Brameld, 1965). Reusch states that what we need is "a first approximation to a scheme that will enable us to represent physical, psychological and social events within one system of denotation" (Reusch, 1965).

Writing more generally, Whyte has called for

> . . . a universal method of thought, at once true to nature (so that the structure of all natural processes can be understood) and appropropriate to present-day human nature (so that men and women everywhere can find a common ground in using it) (Whyte, 1950).

L. von Bertalanffy, the instigator of "General Systems Theory," has written of the necessity for "isomorphic laws in science. . ." or "general systems laws," (Bertalanffy, 1953) to enable us to comprehend and integrate general principles of Nature in order to achieve a continuingly more comprehensive view of our world and its processes.

While what we may call general systems thinking has been gaining its adherents in scientific fields, it has scarcely begun to make any impression on Education. In this discussion, the bare outlines of a general systems model will be offered that may be of

some value, particularly in the areas of curriculum development, course design and teaching. It is based on what we may call the Principle of Natural Organization, which may be stated as follows: every form tends to articulate its elements into functional structures; every whole is derived from the internal structuring of its parts. This principle is as applicable to conceptual and perceptual organization, as it is to organic organization generally.

2. The Principle of Organization

The Principle of Organization involves two major terms: organizing and organization. By "organizing," we refer to the process through which an organization comes into being, tends towards optimal functioning and is maintained. By the term "organization," we refer to the products of the organizational process, which appear as the vast range of organic and extra-organic (e.g. affective and cognitive) organizations that constitute the present order of Nature, viz: macro-molecules, macro-molecular aggregates, organelles, cells, tissues, organs and organ systems, individuals, communities, institutions, concepts, ideas and idea-systems.

The dual feature of organizing and organization, or organization as process and as product expresses a basic duality in nature at-large. On the one hand there is the process of organization that is constant over time and is recapitulated at successive stages of development. On the other hand there are the products of the process, the unique organizations that are emergent in time,

that are a function of the intrinsic programme of the developing organization, the conditions of the environment, and of the organizational process itself.

In the discussion to follow our concern will primarily be with the process of organization, with examples drawn mainly from perceptual and conceptual data, as these are vital to educational activities.

3. Cycles, Stages and Phases of Organization

The process of organization as it is conceived here is cyclic. It involves two alternating periods: one of divergence, the other of convergence. The completion of a cycle leads to the attainment of a stage of complexity. The number of stages required for any organization to reach its optimum state will differ according to its nature and environing conditions. At the human level, no optimum state beyond the physiological can be inferred as there are no known limits to human affective and cognitive development.

An organization may, or may not, reach its optimum state. Although the tendency for optimization exists in all organizations, absolute determinism cannot be implied. Bertalanffy's statement for organic organizations, regarded here as applicable to extra-organic organizations as well, is that "so long as an organic system has not reached the maximum organization possible to it, it tends towards it (Bertalanffy, 1962). The terminal point reached by an organization may indicate its maximum, more

likely its optimum, or the limitations imposed upon it by its environing conditions and/or the restrictive factors arising within the organization itself. Stultification, distortion and death are the actual and potential restrictors in the organizational process.

Each stage of an organization is attained through a regular series of phases, or loci of dominant operations in the organizational cycle. The development of each phase depends upon a minimal state of development of the preceeding phase. The same may be said of the development of stages, i.e. the development of a stage in an organization depends upon a minimal development of the preceeding stage.

Optimum development, whether of a phase or stage, may not come about, if at all, until after the development of later phases and stages. As organization proceeds there is always a "filling out" behind, and an overall tendency to balance, symmetry and proportion. Several phases and stages may be developing simultaneously, although their genesis will have followed a strictly temporal order of succession.

4. The Process of Organization

A. DIVERGENCE

The first period in the organizational cycle is one of divergent activities, involving the development of structures and functions through the three phases of: initiation, differentiation and relation.

4.1 Initiation.--We may take it as axiomatic that every activity

has an originating point in space-time. We may designate this as a phase-point to indicate that organization begins neither ex-nihilo, nor de novo but is the result of causally prior activities from which, at a critical point, a unique and somewhat amorphous and incipient organization begins to emerge. Objectively, we see this amorphousness in the early development of organisms, in the making of objects and in the creation of works of art. Subjectively, we encounter it in the organization of our percepts and concepts.

Hebb points out that a percept for newly sighted, but previously congenitally blinded patients is an amorphous, inchoate unity (Hebb,1949a). Murphy says the same of the neonate's perceptions (Murphy, 1947), and Vygotsky writes of the young child's tendency to "merge the most diverse elements into one unarticulated image on the strength of some chance impressions" (Vygotsky, 1965).

4.2 Differentiation.--The development of any organization involves the differentiation of parts having specific locations or functions, such that one may state the rule: no differentiation, no organization. "In all living things," says Waddington, "differentiation is a basic law of nature" (Waddington, 1953).

Differentiation is called for to bring an organization beyond a minimal state of activity, whether this concerns the development of an organism, or any act, object, process or idea. Werner, in discussing perceptual organization says:

the formation of percepts seems in general to go through an

> orderly sequence of stages. Perception is at first global, whole qualities are dominant. The next stage might be called analytic; perception is selectively directed towards parts (Werner, 1957).

The same differentiating tendencies are required for the organization of concepts. According to Ausubel,

> contemporaneously as a concept is acquired, certain characteristic changes take place. . . It becomes increasingly less global, less impressionistic, and less diffuse. . .; the learner focuses progressively on more salient critical attributes (Ausubel, 1968).

Harvey, et al, say that "progressive development at every stage involves training conditions that induce openness of the conceptual system to differentiation. . . (Harvey, et al, 1961), while Angyal points to some pedagogical implications:

> The accumulation and organization of knowledge in a planned study may be compared to the process of biological differentiation. Developmental processes, as a rule from an initial diffuse state to a state of greater differentiation, in which parts become more distinct and gain more individuality(Angyal, 1968).

Conceptual differentiation is the needed sorting procedure to give meaning to a message, whether it is sensorilly, perceptually or conceptually derived. In the crudest terms, we speak of conceptual differentiation as "trial-and-error" behaviour; Piaget speaks of it as "groping" (Flavell,1963). In more sophisticated language we speak of "discrimination," whether this concerns problem solving, discovery, or creative activity. Schroeder et al define "discrimination" as, "the capacity of a conceptual structure to distinguish among stimuli" (Schroeder, et al,1967a).

While differentiation is essential for organizational development, over-differentiation (differentiation taken to the point

of separateness or non-relatedness of elements, parts or aspects) is dangerous if not lethal. The result is a dissipation of energies and a breakdown in the organization's tendency towards a dynamic equilibrium.

4.3 Relation.--The emergence of organization at any stage of development requires the establishment of functional connection, or pathways of communication among and between differentia. These, when maintained over time become the basic structure of the developing organization. This is seen at the tissue level in the factor of junctional communication between cells. Writing of cortical organization, Hebb notes that "repeated stimulation of specific receptors leads slowly to the formation of association area cells" (Hebb,1949b), which underlies the organization of a given percept or class of percepts.

Werner speaks of structuring, i.e. the establishment and maintenance of functional connections as, "a basic tendency in perceptual organization" (Werner,1957b), while Wolfe, in writing of conceptual learning--and thus conceptual organization--says that "it consists not only or recall and retention of isolated objects and situations, but of relating objects and situations to each other" (Wolffe, 1946).

Thus, unless thought and action is to be dispersive and fragmentary, to be subject to what Bruner has called, "episodic empiricism," the establishment of functional relationships among and between differentia, and hence the establishment of a func-

tional structure in cognitive organization is essential. Says Bruner:

> Episodic empiricism is illustrated by information gathering that is unbound by prior constraints, that lacks connectivity, and that is deficient in organizational persistence. The opposite extreme is illustrated by an approach that is characterized by constraint sensitivity, by connective maneuvers, and by organized persistence (Bruner, 1969).

With the fullness of differentiation, with the elaboration of a relational system and a structure, the divergent period of the organizational process at any given developmental stage is brought to a close. For pedagogical purposes, we have Ausubel's statement:

> Here it is hypothesized, two principles concerned with the efficient programming of content are applicable irrespective of the subject matter field--the principle of progressive differentiation and the principle of integrative reconciliation (Ausubel, 1965).

The matter of integrative reconciliation will be taken up in the following section.

B. CONVERGENCE

There is a limiting condition that restricts the amount and kind of divergence that is possible for any organization at any stage of its development. This is the tendency for orderly and internally harmonious development, the tendency for "structuro-functional integrity and wholeness" (Russell, 1945), or "Holism" (Smuts, 1961a).

Functionally, holism is expressed in the tendency of every organization to move towards greater thermodynamic efficiency or

"good adaptiveness" with its environment. Structurally, holism is marked by the tendency of every organization towards increasing its symmetry, balance and proportion. Overall holism is demonstrated in the articulation of elements, aspects or parts, that, emerging from minimally differentiated or inchoate beginnings become increasingly functionally-specific. In Smut's terms,

> From the more or less homogeneous, to the heterogeneous multiplicity and again to greater, more advanced harmony, to a harmonious and cooperative structural unity; such a formula may serve as a rough-and-ready description of the holistic process (Smuts,1961b).

It may also serve as a rough-and-ready description of the process of organization.

The convergent period of organization, with which we shall now deal comprises three further phases: integration, transition, and concentration.

4.4 Integration.--Integration, or to use Bennett's pithy phrase, "inner-togetherness" (Bennett, 1956), involves bringing the differentia of forming organization into a functional unity. It marks the transformation of the organizational process into a unique product at a given stage of its development. Lacking integration, there would be but an aggregate of elements without functional connections and organization would thus be impossible.

In physics, the factor of integration is translated into the notion of the "steady state." For some time biologists have

used the term "homeostasis" to indicate the organism's tendency to maintain its integrity or equilibrium. Clinical psychologists concern themselves with the integration of personality, or cognitivists in dealing with the integration of perceptual and conceptual phenomena speak of a gestalt to signify the equilibrium state. Thus, according to Gobar, a percept "is a structure which consists of the synthesis of a set of elements into a whole. . . that is, a gestalt" (Gobar, 1968). The same may be said of a concept. Or, of cognitive organization generally we may note that with the phase of integration, the forming cognition becomes the formed cognition, and this is the case whether we are dealing with the acquisition or the generation of cognitive organization.

4.5. Transition.--As we have seen, in the course of its development an organization increasingly comes under the control of integrative forces. These enable it to both establish and maintain a new stage of form and function. Now, once an organization reaches its optimum state, no further development is expected. If, however, the optimum has not been reached such that further development is implied, and can be supported by the environment, a tension then appears between the achieved state and possibility; between the tendency to stasis and self-maintenance on the one hand and the tendency to optimization--or in Maslow's terms, "fuller and fuller being" on the other (Maslow,

1962).

From the standpoint of perceptual organization, transition involves the individual's re-centering on the object of perception, a task that may be called for because of a change in the object, in the environment or in the perceiver. From the standpoint of conceptual organization, transition is called for when a concept can be shown to be incomplete, to display inadequacies--for example, when its information-content is incomplete--, or when its deductive implications are unclear, such that it is necessary that the individual seeks to press towards greater clarity, or to go beyond what has been attained for the sake of new possibilities

This is somewhat of a critical matter. While we may have found a particular percept or concept to be adequate at one point, we may find that it is no longer so, yet be reluctant to go beyond the achieved state. We may prefer to cling stubbornly to old ideas in the face of contrary evidence or the inadequacy of our ideas. Everything that we have sought to understand unavoidably becomes a reference point for our activities and hence a limitation that we may need to overcome. The tension is unavoidable if development is to continue: "The system itself must generate conflict if it is to evolve beyond an adaption characterized by fixed rules" (Schroeder, et al, 1967b).

This phase also has important pedagogical implications. Our general tendency in course design or teaching is to bring the student to the phase of integration, and thus to the completion

of a stage of learning. Arrangements to assist the student to transit out of his achieved stage to a new one are seldom provided. He is usually left to his own devices to overcome the hiatus between the completion of one programme or the initiation of another. The position that is suggested here, is that with the completion of a set of learnings, provisions should be made to assist the student to overcome his achieved state, or prepare the way towards "a next step ahead."

4.6. Concentration.--Continued development requires a concentration of energies within the organization in order to overcome any restrictions which may be imposed upon it by the environment or the achieved organizational structure.

Should the energies for development be inadequate to overcome either internal or external restrictions, the immediate question is not of organizational development but of survival, for an organization that fails to develop its programme or potentialities tends to atrophy and die. Should the available energies be generally adequate for development, then three possibilities appear: (a) the concentration of available energies will be sufficient to overcome all obstacles without distortion, (b) the obstacles, whether organizational or environmental, will be overcome but with distortion. (c) the concentration of energies, although potent, may be sufficiently blocked that it will become disruptive and damage or destroy the

organization from within.

If the concentrated energies are successful in their thrust towards further development, they will, by their very intensity, yield a transformation of state and bring about a new level of organizational complexity, to the extent that we may state the rule: concentration precedes emergence. This rule seems to be as applicable to psychology as it does to physics and chemistry.

While organic organizations are internally, or self-organizing systems, that are capable of concentrating their energies for further development, this cannot be said--as far as we know--of perceptual or conceptual organizations. Rather, the individual must determine to press his percepts or concepts to further stages of development--to organize them from outside.

We do this with our percepts, when they strike us as incomplete, or as harbouring more information so that we feel impelled to intensify the very energies of our perceptual processes, until as a result of our concentrated attention, objects are seen, "in a new light." And the case of conceptual concentration is similar. When we are no longer satisfied with our concepts; when we are trying to press towards new realizations; when we struggle to conceive, to have a "mental break-through," conceptual concentration is called for--a concentration of energies that can take us across a threshold to a "higher" stage of realization.

5.7. Transformation.--The transformation of state--the metamor-

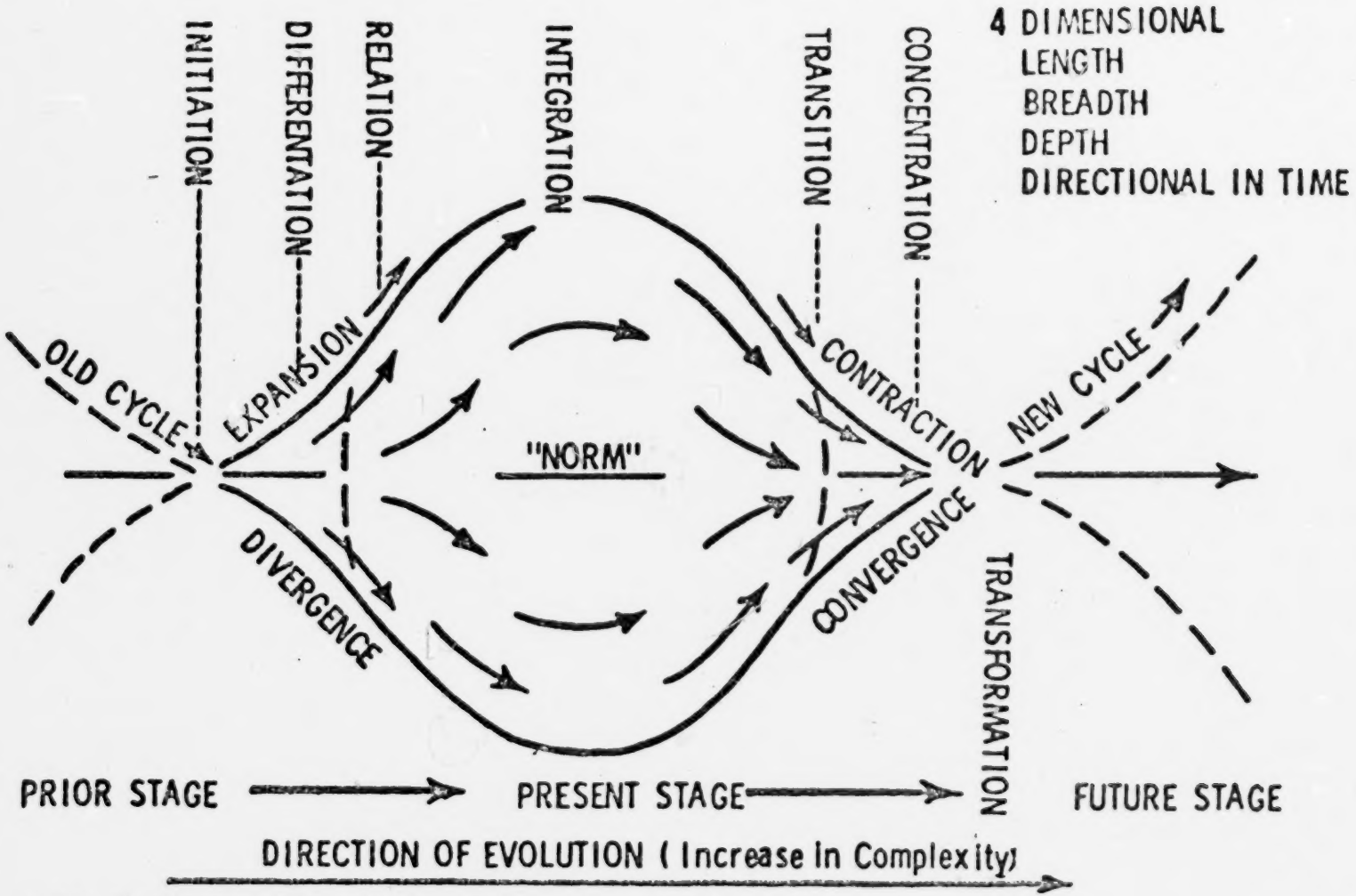
phosis--of organizational energies and activities that is derived from the phase of concentration becomes the phase-point of origination for the next stage in the development of an organization. The achieved organizational product gives rise to the organizational process; the convergent period of the old cycle is brought to its close and the divergent period for a new cycle begins.

With the developmental energies and activities freed from the constrictions of the phase of concentration and the prior organizational structure, they can expand into the environment and re-establish at a "higher turn of the spiral,: the further phases of differentiation, relation, integration, transition concentration, and transformation, which may, in turn, lead to an additional stage or stages of development. It should be noted of course, that development through one or more stages is by no means guaranteed for any kind of organization. Fixation and arrest is always possible at any point.

At each level of development (or of complexity), the organizational product is emergent and unique, the organizational process is continuous; a cycle of recurring activities.

Translated more concretely into educational terms, this model of natural organization may also be understood as a model for education; that is to say, it is regarded as fundamental to both a theory of learning, and of teaching or instruction. Hence, the periods of divergence and convergence, and the phases of organization are offered as normative criteria for educational programming and practice.

A MODEL OF NATURAL ORGANIZATION



NOTE: Fixation and Arrest is possible at any point.

References

Angyal, A. (1968), Foundations for a Science of Personality, (Cambridge, Mass.: Harvard University Press), pp. 7-8.

Ausubel, D. (1965), in Readings in the Psychology of Cognition, ed.by R.C. Anderson and D. Ausubel, (New York: Holt, Rinehart and Winston), p. 109.

Ausubel, D. (1968), Educational Psychology, (New York: Holt, Rinehart and Winston), p. 519.

Bennett, J.G. (1956), The Dramatic Universe, Vol. I, (4 Vols., London: Hodder and Stoughton), pp. 59-60.

Bertalanffy, L. von (1950), "An Outline of General System Theory", The British Journal of the Philosophy of Science, Vol.I, No.2.

Bertalanffy, L. von (1962), Modern Theories of Development, (New York: Harper and Row), p. 186.

Brameld, T. (1965), The Use of Explosive Ideas in Education, (Pittsburgh: University of Pittsburgh Press), p. 10.

Bruner, J. (1969), in The Nature of Teaching, by L. Nelson, (Waltham, Mass.: Blaisdell), p. 202.

Flavell, J. (1963), The Developmental Psychology of Jean Piaget, (Princeton, N.J.: Van Nostram), pp. 75-76.

Gobar, A. (1968), Philosophical Foundations of Genetic Psychology and Gestalt Psychology, (The Hague: Martinus Highoff), p. 59.

Harvey, O.J. et al. (1961), Conceptual Systems and Personality Organization, (New York: Wiley), p. 89.

Hebb, D.O. (1949), The Organization of Behavior, (New York: Science Editions), p. 29.

Hebb, D.O. (1949b), op. cit., p. 60.

Maslow, A. (1962), Towards a Psychology of Being, (Princeton, N.J.: Van Nostrand), p. 151.

Murphy, G. (1947), Personality, (New York: Harper), p. 334.

Reusch, J. (1956), in Towards a Unified Theory of Human Behavior, ed. by R. Grinker, (New York: Baric Books), p. XI.

Russell, E.S. (1945), The Directiveness of Organic Activities, (Cambridge, Cambridge University Press), p.11.

Schroder, H.M. et al. (1967a), Human Information Processing, (New York: Holt, Rinehart and Winston), pp. 24 ff.

Schroder, H.M. et al. (1967b), op. cit., pp. 17-18 ff.

Smuts, J.C. (1961a), Holism and Evolution, (New York, Viking), p. 232.

Smuts, J.C. (1961b) loc. cit.

Waddington, C.H. (1953), "How Do Cells Differentiate?", in Scientific American,(San Francisco: W.H. Freeman), p.2.

Werner, H. (1957a) in The Concept of Development, ed. by D.B. Harris, (Minneapolis: University of Minnesota Press), pp. 128-129.

Werner, H. (1957b) ibid.

Whyte. L.L. (1950), The Next Development in Man, (New York: New American Library), p. 10.

Wolffe, W. (1946), The Personality of the Pre-School Child, (New York: Grune and Stratton), p. 27.

Vygotsky, L. (1965), Thought and Language, (Cambridge, Mass.: M.I.T. Press), p. 60.